ABSTRACT

The invention provides for a functionally-graded metal substrate that is made of at least two metal compositions, a functional insert and a surrounding body that surrounds the functional insert. In a preferred embodiment of the invention a functional insert powder composition of loose powder metal is placed in a compact of a surrounding body powder composition and both metal compositions are sintered in a sintering furnace to form a sintered part. The sintered part is infiltrated in part or in whole with a molten metal compound to produce a functionally graded metal substrate having a density of at least 90% of theoretical. A heat-generating component such as a chip can be attached to the metal substrate for use in microelectronic packaging. When the functionally-graded metal substrate has two discrete compositions of copper/tungsten the surrounding body which has a CTE that ranges from about 5.6ppm/°C to about 7 ppm/°C constrains the expansion of the functional insert which has a thermal conductivity that ranges from about 200 W/mK to about 400 W/mK.